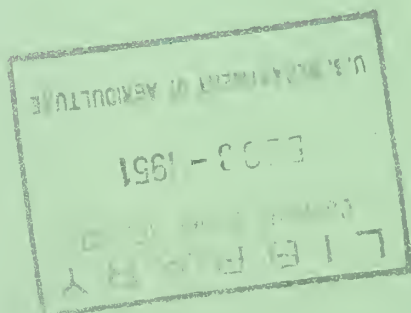


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INTERMEDIATE WHEATGRASS FOR RESEEDING SOUTHWESTERN PONDEROSA PINE AND UPPER WOODLAND RANGES IN THE SOUTHWEST

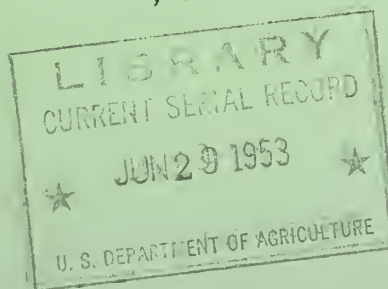
By Fred Lavin
Range Conservationist



Intermediate wheatgrass increases forage production on ponderosa pine and upper woodland ranges

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Southwestern Forest and Range Experiment Station
Tucson, Arizona
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INTERMEDIATE WHEATGRASS FOR RESEEDING SOUTHWESTERN PONDEROSA PINE RANGES

By

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Introduction

Intermediate wheatgrass (Agropyron intermedium) is making a place for itself in the reseeded of many depleted southwestern ponderosa pine ranges. It fills the gap between the more drought-resistant crested wheatgrass and species with higher moisture requirements such as smooth brome and orchardgrass.

Why Reseed With Intermediate Wheatgrass

Intermediate wheatgrass is outstanding in its ability to hasten range recovery and bring about rapid increases in forage production on ponderosa pine range sites where it is adapted (fig. 1). For example, in trial plantings at Fort Valley and White Horse Lake, Arizona, it produced more than a half ton of herbage per acre the first year after planting. At No Agua, New Mexico, it produced over 12 times as much forage as deteriorated native range two years after planting. At these three major test areas in the ponderosa pine type intermediate wheatgrass significantly outyielded crested wheatgrass, smooth brome, and the native vegetation (Table 1). Production records show that it also maintains higher forage production even during drought periods than many other introduced grasses. Thus it provides a more dependable as well as a more ample forage supply.

In early growth stages intermediate wheatgrass is palatable to all classes of livestock. After maturity, however, palatability declines somewhat because of the coarse, stiff seedstalks. This grass is high in crude protein, especially during the spring and fall. Its habit of vegetative propagation by underground stems enables it to spread, even under rather heavy grazing.

Intermediate wheatgrass, being a cool season grass, furnishes palatable, nutritious forage in spring and fall when summer growing, native vegetation is dormant and range forage frequently scarce. Hence it is valuable for balancing seasonal forage supplies and extending the period of high nutritional forage level on the range. It makes green succulent forage available at calving or lambing time in the spring and for finishing livestock for market in the fall. Supplemental feeding can often be decreased or eliminated by reseeding adaptable areas to this versatile wheatgrass.

^{1/}Maintained by the Forest Service, U. S. Department of Agriculture, for Arizona, New Mexico, and West Texas, with headquarters at Tucson, Arizona.

Table 1.--Herbage yields at three major reseeding areas
in the ponderosa pine type

Location	Inter- mediate wheat- grass	Crested wheat- grass	Smooth brome	Native vegetation
Fort Valley, Arizona				
Herbage yield, lbs/acre ^{1/}	1,680	1,180	1,240	430
Age of stand, years	3	3	3	Protected 11 yrs.
Elevation, 7,400 ft.				
Annual rainfall, 23.2 in.				
White Horse Lake, Arizona				
Herbage yield, lbs/acre	1,043	380	400	230
Age of stand, years	1	1	1	Protected 4 yrs.
Elevation, 6,900 ft.				
Annual rainfall, 22.1 in.				
No Agua, New Mexico				
Herbage yield, lbs/acre	890	690	-	70
Age of stand, years	2	2	-	Protected 2 yrs.
Elevation, 8,200 ft.				
Annual rainfall, 18.0 in.				

^{1/}Air-dry weight.

Intermediate wheatgrass can also be used to advantage as a high-producing, nutritious, palatable hay crop. When used for hay it should be cut in the early bloom. If harvested later the stem growth becomes woody, lessening the palatability and nutrient value. After cutting, intermediate wheatgrass makes rapid regrowth of palatable basal leaves with few stems.

Where adaptable, intermediate wheatgrass is outstanding for erosion control. Its ease of establishment, seedling vigor, and rapid growth provide a dependable, dense, leafy ground cover the first year. Its aggressiveness, strong root system, and sod-forming habit increase its value and usefulness as a soil stabilizer. Its excellent growth in the late fall provides ground cover which protects the soil throughout the winter. This species should find wide usage for stabilizing soils on burns, logging scars, water drainage ways, road banks, earthen dams, and other disturbed areas in the pine zone.

The high production of fibrous roots of intermediate wheatgrass also improves the soil structure. Root measurements^{2/} show that this

^{2/}Hafenrichter, A. L., Muller, L. A., Brown, R. L. Grasses and legumes for soil conservation in the Pacific Northwest. U. S. Dept. Agr. Misc. Publ. No. 678, Dec. 1949.



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Figure 1.--Intermediate wheatgrass is outstanding for hastening range recovery and bringing about rapid increases in forage production on deteriorated ponderosa pine ranges. (A) A deteriorated park which has received 4 years of complete protection from livestock and is producing only 130 pounds of air-dry herbage per acre. Note low value weedy cover. (B) Same area 1 year after planting to intermediate wheatgrass. It is producing 1,050 pounds of air-dry herbage per acre. (C) Same area 2 years after planting. It is producing 1,300 pounds of air-dry high-value herbage per acre, a tenfold increase in 2 years.

species produced 7,400 pounds of roots per acre in the surface 8 inches of soil as compared with 3,200 pounds for smooth brome. This caused a marked improvement in the soil structure, increasing its resistance to erosion and enabling it to take up water more rapidly. Such soil improvement is of the utmost importance on most ranges in need of reseeding for they are usually low in organic matter and have poor structure because of trampling by livestock and beating by rain.

What Is Intermediate Wheatgrass?

Intermediate wheatgrass is a tall, sod-forming, cool season grower which was introduced into the United States from Caucasus, U. S. S. R., in 1932. It first attracted major attention in South Dakota and since then has been extensively tested in the northern and central Great Plains and in the Pacific Northwest under a wide variety of soil and moisture conditions. It was first tested on range lands of the Southwest in 1945.

Intermediate wheatgrass spreads from underground stems and forms an open sod. It produces an abundance of basal leaves; coarse, leafy stems 3 to 4 feet high; and erect to slightly nodding seedheads 6 to 14 inches long (fig. 2). The color varies from a light to a dark green and some plants are covered with a whitish bloom.

Considerable variation occurs in color, texture, and leafiness so that several different forms have been recognized. An especially vigorous type is being commercially distributed under the name of "Ree wheatgrass." Recently a dwarf type from Bolu, Turkey, has been described.^{3/} This type is leafier, has finer stems, and is later-maturing, but seems to require the same conditions for growth as the larger type.

How Intermediate Wheatgrass Grows

Intermediate wheatgrass seed will germinate three or four weeks after harvesting. With adequate moisture, seedlings emerge within a week after planting. Seedlings are large and vigorous, resembling winter rye, and grow much faster than crested wheatgrass. They are also resistant to most diseases so that good, even stands are usually obtained. Rapid seedling growth gives a quick, dense, leafy ground cover, and some seed may be produced the first year. Seedlings compete well with weeds and tend to crowd out other smaller grasses and legumes.

This grass has a long growing period. In the Southwest, it usually begins growth as soon as the snow goes off and remains green through severe spring frosts. A lush growth of basal leaves 6 inches in height by early April is not uncommon. The plant

^{3/}See footnote 2, page 2.

remains green throughout the dry weather of late spring and resumes rapid growth with the advent of summer rains. Seedheads develop in July and mature in August. If moisture is available in the fall, good regrowth of basal leaves is made. This fall regrowth remains green through early fall frosts and often furnishes green forage until it is covered by heavy snows.

The root system is vigorous and occupies the soil to a depth of 3 to 4 feet. Vegetative spread by underground stems is less rapid than for either western wheatgrass or smooth brome. The stand, therefore, remains more open than most other sod-forming grasses and maintains high production longer.

When intermediate wheatgrass was first introduced, there was fear that it might become a pest because of its aggressiveness and superficial resemblance to quackgrass. Later experience has shown that it can readily be eliminated by plowing, and that old stands are as easily controlled as smooth brome or western wheatgrass.

Seed Harvesting

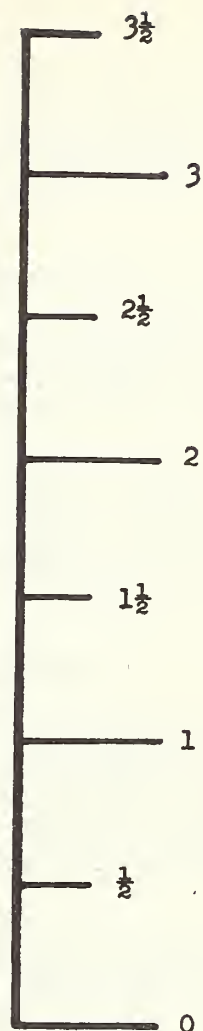
On level, rock-free sites with fertile soil intermediate wheatgrass seed may be profitably collected. Seed should be harvested when at least three-fourths of the spikelets on the head have turned brown or soon after the earliest matured spikelets show signs of shattering. If seed is harvested too early, a large percentage will be light and chaffy. Threshing will be more difficult and germination will be poorer.

Seed may be harvested with any standard farm harvesting equipment but binding and shocking is the preferred method. The seed is easily threshed and cleaned without any special processing operations.

Where to Plant Intermediate Wheatgrass

Intermediate wheatgrass requires fairly good moisture conditions for satisfactory development and survival. At the relatively cool, higher elevations, above 7,500 feet in the Southwest, the annual precipitation should be at least 15 inches. At lower elevations, where evaporation is greater, the annual rainfall should be at least 17 inches. Like other cool season grasses, intermediate wheatgrass makes most of its growth on winter moisture and it is not adapted to the lower elevation ranges where summer rains provide most of the moisture for forage growth.

Intermediate wheatgrass is best adapted to the ponderosa pine zone in northern Arizona and New Mexico. It is well suited for planting depleted parks where only snakeweed, pingue, or annual weeds grow, openings once farmed but abandoned, and on timbered lands that have been devastated by fire or disturbed by logging. This grass can also be used in those parts of the woodland and



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Figure 2.—A 2-year-old intermediate wheatgrass plant.
Note vigorous vegetative spread.

sagebrush zones in Arizona and New Mexico where the presence of scattered ponderosa pines indicate especially favorable moisture conditions. Successful establishment and continued high forage production is somewhat uncertain, however, except in the pine zone.

Intermediate wheatgrass should not be planted on the drier woodland and sagebrush ranges. For example, one 10-acre stand in the woodland type produced 1,350 pounds of air-dry herbage per acre with 11.5 inches of rain in 1950, but died out during the severe drought year of 1951 when precipitation dropped to 8.1 inches.

Intermediate wheatgrass does best on level, deep, fertile, well-drained soils. However, it will grow well on a wide variety of soils ranging from light sands to heavy clays. It has good resistance to standing water and tolerates moderate amounts of alkali.

How to Plant Intermediate Wheatgrass

Some treatment to remove the competing vegetation and prepare the soil is usually necessary for the successful reseeding of intermediate wheatgrass. Planting without seedbed preparation has generally been unsatisfactory except on burns and logging scars where the ground surface is already loose and competing plant cover partially controlled.

Different intensities of seedbed preparation exerted a marked effect on forage production in trial plantings of intermediate wheatgrass on a heavy clay soil at White Horse Lake, Arizona (Table 2). The excellent seedling vigor and rapid growth of intermediate wheatgrass permit rather simple seedbed preparation. Seedbeds prepared by shallow disk plowing or disking all resulted in good seedling establishment. Plantings on the seedbeds plowed to 3 or 4 inches initially outyielded those on less intensively prepared seedbeds. At the end of four growing seasons stands on disk-plowed seedbeds were still best, producing over three times as much herbage as those on the disk-harrowed seedbed and over seven times as much as on the uncultivated seedbed. The plowed seedbed provided more effective elimination of competition, better soil tilth, higher infiltration rates, and over-all improvement of plant-soil relations. Shallow plowing to a depth of 3 or 4 inches may thus more than pay for itself by increased forage yields over several years.

Disk plows are generally superior to moldboard plows on range lands because they can be operated better in rocky, root-filled, or shrub-covered ground, and under a wider variety of soil conditions. Especially well suited for cultivating range lands are the brushland, wheatland, and standard disk plows, and the heavy duty offset disk harrow. The light disk harrow is not satisfactory except for the reduction of annuals on light, loose-textured soils.

Table 2.--Effects of different methods of seedbed preparation on seedling establishment and herbage yields of intermediate wheatgrass in a natural pine opening with a heavy clay soil at White Horse Lake, Arizona

Broadcast Seeded July 1948

Seedbed preparation	:Number of :	Herbage yields		
	:seedlings :	(lbs/acre, air-dry)		
	:per square:	:	:	:
	:foot, 1949:	1949	: 1950	: 1951
Shallow disk-plowed, disk-harrowed, <u>1/</u> cultipacked	1.6	1,200	1,300	1,050
Shallow disk-plowed	1.8	1,030	1,010	1,390
Disk-harrowed <u>1/</u>	1.5	510	500	450
Pitted	.6	90	180	370
None	Trace	20	30	190

1/Tillage done with light disk harrow.

The seeding method used must provide for even distribution of seed at the desired rate and depth. While drilling does this best, broadcasting can be effectively used where drilling is not feasible because of rough, rocky, or trashy ground, trees, or inaccessibility. Broadcasting alone works well on loose seedbeds since the seed is covered by natural sloughing of the soil. However, where the soil surface is crusted or compacted seed should be covered after broadcasting. This can be done by harrowing; light disking; or dragging with brush, chain, or rail.

Covering the seed provides protection against harmful moisture and temperature fluctuations. At the same time, seed must not be covered so deeply that the seedlings are unable to force their way out of the soil. The best planting depths for intermediate wheatgrass are from 1/2-inch on heavy soils to 1-inch on sandy soils.

Intermediate wheatgrass can be planted at comparatively low rates because of its large seedlings and excellent seedling vigor. Seeding at 6 to 10 pounds per acre is recommended for seed with a purity and germination of 90 percent. When purity and germination are lower, more seed must be used. The higher seeding rates should be used when broadcasting on the poorer seedbeds and the lower rates when drilling on the better ones. Successful seed production has been obtained by planting 4 pounds per acre in drill rows 42 inches apart to permit cultivation.

Good seedling establishment depends upon planting when moisture and temperature are most favorable for rapid germination, emergence, and growth. In the Southwest planting at the beginning of the summer rains, in late June or July, best provides these conditions.

Planting may be continued into the fall at higher elevations where a dependable heavy snow blanket protects the seedlings from winter injury. The melting snow also provides enough moisture to carry the young plants through the normally dry spring period.

Managing Intermediate Wheatgrass

Reseeding is a poor investment unless reseeded stands are properly managed for the greatest continuous grass production. Basic principles of good management are as essential for grazing intermediate wheatgrass as for native ranges. These include such measures as initial protection from grazing, conservative stocking, good distribution of livestock, and proper time of use.

New stands of intermediate wheatgrass should not be grazed until the end of the second growing season. This allows the plants to develop sufficient root and top growth to resist grazing and other hazards such as drought and disease.

Grazing readiness varies with elevation and weather. Before livestock are admitted to intermediate wheatgrass stands in the spring, the soil should be dry enough that it is not cut up and compacted by the hoofs of animals and that the young plants are not pulled loose by grazing. Also, the plants should be growing vigorously and the new growth at least 8 inches tall.

Conservative grazing is one of the most important rules for good management of intermediate wheatgrass. Conservative grazing means maximum sustained livestock production while maintaining a good stand of grass. Overuse, on the other hand, causes decline of plant vigor which is ultimately reflected in lower grazing capacity. While proper utilization standards have not yet been fully developed for intermediate wheatgrass, it appears that grazing 50 percent of the total herbage by weight is a safe, conservative practice which will maintain the stand in a good productive condition. This amounts to leaving an average stubble height of about 6 inches. The heights to which individual plants are grazed will vary from this average, so that the range as a whole when properly grazed will have an uneven, patchy appearance.

Proper livestock distribution is often more difficult on intermediate wheatgrass than on native ranges because the greater grazing capacities intensify concentration of livestock on favored areas. Increased attention to such measures as fencing, water development, salting, and riding are necessary to maintain good distribution of livestock.

7. Plant during June and July when moisture and temperature are most favorable for rapid germination, emergence, and growth. At higher elevations with dependable heavy snowfall plantings may be continued until weather stops the work in the fall.

8. Manage the reseeded stand properly by: (a) protecting new stands from grazing for the first two growing seasons, (b) grazing conservatively so that not more than 50 percent of the herbage by weight is utilized, (c) maintaining good livestock distribution by fencing, water development, salting, and herding and riding, and (d) delaying spring grazing each year until after the ground is dry, plant growth vigorous, and new leaves well developed.

9. Use reseeding only where the range cannot be improved naturally through better management. Then make it part of overall good management whereby not only the reseeded areas but the native range is benefited.

